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ZEILBERGER, DANIEL	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/542,076	ECK, KAI	
	Examiner	Art Unit	
	DANIEL ZEILBERGER	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,9,12,18 and 21-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,9,12,18 and 21-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

This office action is in response to applicant's reply dated November 24, 2008.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. *Claims 9, 22, 24, 27 and 29* are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding **claim 9**, the claim contains the limitations of “a radiotranslucent sheet” at line 11 of the claim. However, the originally filed specification fails to disclose a radiotranslucent sheet, stating instead at paragraph 31 that the marking means comprises an X-ray-transparent foil. **Appropriate correction is required**.

Regarding **claim 22**, the claim contains the limitation of “wherein the marking elements are sized to cover only one of the sensor elements”. However, this limitation is not supported by the originally filed specification. The most similar area of the specification (at paragraph 31) states that the marking elements "are also of a size that

is as small as possible, which is preferably selected such that a marking element 6 ***approximately*** covers the area of an image sensor in the X-ray detector 3". Thus while the specification states that a marking element only approximately covers the area of the image, the claimed limitation is more specific by removing the approximate nature of the relationship. **Appropriate correction is required**.

Regarding **claim 24**, the claim contains the limitations of "a mechanically flexible radiotranslucent layer" at line 2 of the claim. However, the originally filed specification fails to disclose a radiotranslucent layer, stating instead at paragraph 31 that the marking means comprises an X-ray-transparent foil. **Appropriate correction is required**.

Regarding **claim 27**, the claim contains the limitation of "the marking elements are sized to cover one of the sensor elements". However, this limitation is not supported by the originally filed specification. The most similar area of the specification (at paragraph 31) states that the marking elements "are also of a size that is as small as possible, which is preferably selected such that a marking element 6 ***approximately*** covers the area of an image sensor in the X-ray detector 3". Thus while the specification states that a marking element only approximately covers the area of the image, the claimed limitation is more specific by removing the approximate nature of the relationship. **Appropriate correction is required**.

Regarding **claim 29**, the claim reads "wherein the marking elements have N different absorption levels and the two dimensional, cyclical maximum length sequence is N-valent, where N is a plural integer. However, this limitation is not supported by the

originally filed specification. The most similar area of the specification (at paragraph 36) does discuss the possibility of having multiple absorption levels to support "trivalent, quadrivalent, quinquevalent, or high value sequences…" However, the specification makes no mention of having the number of absorption levels match N in the N-valent sequence. In fact, paragraph 35 of the specification, where the binary case (i.e. N=2) is disclosed, a 1 is represented by a marker element being present and a 0 is represented by no marker element being present, and thus in the N=2 case, only 1 absorption level is disclosed. **Appropriate correction is required**.

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. *Claims 1, 18, 21, 22, 24-26, 28, 30-32* are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding **claim 1**, the claim recites the limitation of "providing a pattern of marking elements that are individually not visibly evident to a computer system and to a human viewer of the diagnostic image". However, the scope of this limitation is unclear. In particular, it is unclear what comprises "individually not visibly evident". If "individually not visibly evident" were construed to mean undetectable, than the claim would not coincide with the device as explained in the Applicant's specification, and would not be operable. Indeed in Applicant's specification the marking elements are detectable by the computer system. However, taking the marking elements to be detectable by a

computer system and a human viewer appears to also conflict with the applicant's specification. Appropriate correction is required, however for the purposes of examination the limitation will be construed as --providing a pattern of marking elements that do not entirely block an underlying image--.

Further regarding **claim 1**, the claim lacks antecedent basis for "the diagnostic image" and "the image" at line 5 and line 9, respectively, rendering it unclear what "the diagnostic image" and "the image" are. Appropriate correction is required, however for the purposes of examination, "the diagnostic image" will be interpreted as --the reconstructed diagnostic image-- and "the image" will be interpreted as --the reconstructed diagnostic image--.

Regarding **claim 18**, the claim recites the limitation of "forming the pattern of marking elements with a combination of a size, a shape, and a material that renders the marking elements not visibly evident individually in the image to a machine viewer". However, the scope of this limitation is unclear. In particular, it is unclear what comprises "not visibly evident individually". If "not visibly evident individually" were construed to mean undetectable, than the claim would not coincide with the device as explained in the Applicant's specification, and would not be operable. Indeed in Applicant's specification the marking elements are detectable by the computer system. However, taking the marking elements to be detectable by a computer system and a human viewer appears to also conflict with the applicant's specification. Appropriate correction is required, however for the purposes of examination the limitation will be

construed as -- forming the pattern of marking elements with a combination of a size, a shape, and a material that do not entirely block an underlying image--.

Regarding **claim 21**, the claim recites the limitation of “wherein the marking elements appear in the diagnostic image as a watermark which is invisible in image analysis”. However, this does not coincide with the device as explained in the Applicant's specification where image analysis is employed to find the marking elements, and would not be operable. Thus it is unclear what scope “invisible in image analysis" should have. Appropriate correction is required, however for the purposes of examination the limitation will be construed as --wherein the marking elements appear in the diagnostic image as a watermark--.

Further regarding **claim 22**, the claim lacks antecedent basis for “the image” and “the diagnostic image” at line 2 and line 7, respectively, rendering it unclear what “the diagnostic image” and “the image” are. Appropriate correction is required, however for the purposes of examination, “the image” will be interpreted as --the reconstructed diagnostic image-- and "the diagnostic image" will be interpreted as --the reconstructed diagnostic image--.

Regarding **claim 24**, the claim lacks antecedent basis for “the mechanically flexible layer” at line 4, rendering it unclear what “the mechanically flexible layer” is. Appropriate correction is required, however for the purposes of examination, “the mechanically flexible layer” will be interpreted as -- the mechanically flexible radiotranslucent layer--.

Regarding **claim 25**, the claim recites the limitation of "the marking elements in the reconstructed image are not individually apparent to a human or a machine in the reconstructed image". However, the scope of this limitation is unclear. In particular, it is unclear what comprises "not individually apparent". If "not individually apparent" were construed to mean undetectable, than the claim would not coincide with the device as explained in the Applicant's specification, and would not be operable. Indeed in Applicant's specification the marking elements are detectable by the machine. However, taking the marking elements to be detectable by a machine and a human viewer appears to also conflict with the applicant's specification. Appropriate correction is required, however for the purposes of examination the limitation will be construed as --the marking elements in the reconstructed image do not entirely block an underlying image--.

Further regarding **claim 25**, the claim lacks antecedent basis for "the reconstructed image" at lines 2 and 3, rendering it unclear what "the reconstructed image" is. Appropriate correction is required, however for the purposes of examination, "the reconstructed image" will be interpreted as --the x-ray image--.

Regarding **claim 26**, the claim lacks antecedent basis for "the image" at line 4, rendering it unclear what "the image" is. Appropriate correction is required, however for the purposes of examination, "the image" will be interpreted as --the x-ray image--.

Regarding **claim 28**, the claim contains the limitation of "translucent sheet is flexible". However, aside from being grammatically incorrectly written, it is also unclear what the "translucent sheet" is. In particular, it is unclear whether the "translucent sheet"

is the “radiotranslucent sheet” from claim 9, or a separate “translucent sheet” that is additionally provided. Appropriate correction is required, however for the purposes of examination “translucent sheet is flexible" will be interpreted as --wherein the radiotranslucent sheet is flexible--.

Regarding **claim 30**, the claim lacks antecedent basis for “the generated image” at lines 9 and 11, rendering it unclear what “the generated image” is. Appropriate correction is required, however for the purposes of examination, “the generated image” will be interpreted as --the generated diagnostic image--.

Further regarding **claim 30**, the claim recites the limitation of “individual marking elements are not visibly evident in the generated image to a computer pattern recognition routine”. However, the scope of this limitation is unclear. In particular, it is unclear what comprises “not visibly evident”. If “not visibly evident” were construed to mean undetectable, than the claim would not coincide with the device as explained in the Applicant's specification, and would not be operable. Indeed in Applicant's specification the marking elements are detectable by the computer system. Appropriate correction is required, however for the purposes of examination the limitation will be construed as -- individual marking elements that do not entirely block the generated diagnostic image--.

Regarding **claim 31**, the claim recites the limitation of “wherein the individual marking elements in the generated image are not visibly evident to a human viewer”. However, the scope of this limitation is unclear. In particular, it is unclear what comprises “not visibly evident”. If “not visibly evident” were construed to mean

undetectable, than the claim would not coincide with the device as explained in the Applicant's specification, and would not be operable. Indeed in Applicant's specification the marking elements are detectable by the computer system. Appropriate correction is required, however for the purposes of examination the limitation will be construed as --wherein the individual marking elements in the generated image do not entirely block the generated diagnostic image--.

Regarding **claim 32**, the claim lacks antecedent basis for "the x-ray image" at line 2, rendering it unclear what "the x-ray image" is. Appropriate correction is required, however for the purposes of examination, "the x-ray image" will be interpreted as --the generated diagnostic image--.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. *Claims 1-4, 9, 18, 21-28 and 30-32* are rejected under 35 U.S.C. 103(a) as being unpatentable over Seeley in view of Simon et al. (US Patent 6,118,845), hereinafter referenced as Simon.

Regarding **claim 1**, Seeley discloses a method of determining the position of a patient in reconstructed diagnostic image (see column 16 lines 3-6), the patient being

located on an examination table in an imaging region (see figure 1), the method comprising:

providing a pattern of marking elements (see column 9 lines 18-25, wherein an array or markers is provided, and further see column 13 lines 49-53, wherein it is disclosed that an image processor removes marker shadow-images from the fluoroscope image frame);

obtaining the image (see column 7 lines 19-21, wherein two dimensional projection images are captured).

In addition, while the embodiment of Seeley discussed above fails to disclose claimed “attaching the pattern of marking elements to at least one of the patient that is being imaged and the examination table", the examiner maintains that it would have been obvious, in view of an alternative embodiment, to provide:

attaching the pattern of marking elements to at least one of the patient that is being imaged and the examination table (see column 18 lines 46-66, wherein it is disclosed that affixing the marker array to the support table addresses the issue of the limited flexibility in positioning the image detector near the patient).

Therefore, the examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing “attaching the pattern of marking elements to at least one of the patient that is being imaged and the examination table”, for the purpose of increasing flexibility in position the image detector near the patient.

Seeley fails to disclose “providing a pattern of marking elements that are individually not visibly evident to a computer system and to a human viewer of the diagnostic image”. However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

providing a pattern of marking elements that are individually not visibly evident to a computer system and to a human viewer of the diagnostic image (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing “providing a pattern of marking elements that are individually not visibly evident to a computer system and to a human viewer of the diagnostic image”, as taught by Simon, for the purpose of when the imaged marks 20’ prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 2**, Seeley further discloses:

the position of the marking elements in the image is determined with a pattern matching routine by a correlation of the image with at least one filter image which indicates the pattern of the marking elements (see column 12 lines 21-33, wherein Seeley discloses that one suitable protocol takes a candidate marker Pi in image coordinates, assumes it is marker number Qj of sheet one, and then determines how many other candidate markers support this match, i.e. line up with the expected projections of the remaining markers of one array).

Regarding **claim 3**, Seeley further discloses:

the filter image of the pattern is transformed relative to the actual pattern of the marking elements (see column 12 lines 21-33, wherein Seeley discloses that that one suitable protocol takes a candidate marker Pi in image coordinates, assumes it is marker number Qj of sheet one, and then determines how many other candidate markers support this match, i.e. line up with the expected projections of the remaining markers of one array).

Regarding **claim 4**, Seeley further discloses:

wherein the image is generated by means of radioscopy (see figure 1 and column 7 lines 10-55).

However, Seeley fails to disclose “the marking elements exhibit a low absorption of the X-rays, the effect of which lies within the noise level of the X-ray image”.

However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

the marking elements exhibit a low absorption of the X-rays, the effect of which lies within the noise level of the X-ray image (see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and thus since the markers can be completely eliminated from the image aside from image noise preventing a perfect result, the markers can be considered to have *an effect* within the noise level of the x-ray image, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing “wherein the image generated by means of radioscopy, and the marking elements exhibit a low absorption of the X-rays, the effect of which lies within the noise level of the X-ray image”, as taught by Simon, for the purpose of when the imaged marks 20’ prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 9**, Seeley discloses an X-ray system (see figure 1 and column 7 lines 10-55), comprising:

an X-ray source generating X-rays along a ray path (see x-ray source 22 in figure 1 and column 7 lines 10-55);

an X-ray detector, which is disposed in the ray path of the X-ray source (see imaging assembly 24 in figure 1 and column 7 lines 10-55);

a data processing unit which reconstructs an output of the detector into an x-ray image (see figure 1 and column 7 lines 10-55);

the marking device including a radiotranslucent sheet which carries a pattern of a radioopaque marking elements (see column 10 lines 48-65); and

wherein the data processing unit further processes the x-ray image with a filter mask which replicates the pattern of the marking elements to reveal the pattern (see column 11 line 61 through column 12 line 33).

In addition, while the embodiment of Seeley discussed above fails to disclose claimed “at least one marking device for attachment to at least one of a patient located in an imaging region between the X-ray source and the X-ray detector and an examination table on which the patient is supported in the imaging region", the examiner maintains that it would have been obvious, in view of an alternative embodiment, to provide:

at least one marking device for attachment to at least one of a patient located in an imaging region between the X-ray source and the X-ray detector and an examination table on which the patient is supported in the imaging region (see column 18 lines 46-

66, wherein it is disclosed that affixing the marker array to the support table addresses the issue of the limited flexibility in positioning the image detector near the patient).

Therefore, the examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "at least one marking device for attachment to at least one of a patient located in an imaging region between the X-ray source and the X-ray detector and an examination table on which the patient is supported in the imaging region", for the purpose of increasing flexibility in position the image detector near the patient.

Seeley fails to disclose "radioopaque marking elements of a size, a shape, and a material which exhibits low absorption of the x-rays, the effect of which lies within the noise level of the x-ray image". However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

radioopaque marking elements of a size, a shape, and a material which exhibits low absorption of the x-rays, the effect of which lies within the noise level of the x-ray image (see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and thus since the markers can be completely eliminated from the image aside from image noise preventing a perfect result, the markers can be considered to have *an effect*

within the noise level of the x-ray image, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "radioopaque marking elements of a size, a shape, and a material which exhibits low absorption of the x-rays, the effect of which lies within the noise level of the x-ray image", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 18**, Seeley discloses everything as applied above in regards to claim 1. However, Seeley fails to disclose the limitations of claim 18. However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

forming the pattern of marking elements with a combination of a size, a shape, and a material that renders the marking elements not visibly evident individually in the image to a machine viewer (see 112 rejection above, and further see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image

while leaving the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "forming the pattern of marking elements with a combination of a size, a shape, and a material that renders the marking elements not visibly evident individually in the image to a machine viewer", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 21**, Seeley further discloses:

wherein the marking elements appear in the diagnostic image as a watermark which is invisible in image analysis (see 112 rejection above, and further see array of radiopaque markers in column 10 lines 48-65).

Seeley fails to disclose wherein the marking elements appear in the diagnostic image as a watermark which is invisible in image analysis "and does not distort or impair the diagnostic image". However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the marking elements appear in the diagnostic image as a watermark which is invisible in image analysis "and does not distort or impair the diagnostic image" (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon

discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing wherein the marking elements appear in the diagnostic image as a watermark which is invisible in image analysis “and does not distort or impair the diagnostic image”, as taught by Simon, for the purpose of when the imaged marks 20’ prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 22**, Seeley further discloses wherein the step of obtaining the image includes:

projecting an x-ray beam through the patient and the pattern of marking elements (see x-ray source 22 in figure 1 and column 7 lines 10-55);

receiving the x-ray beam with an x-ray detector that has a plurality of individual sensor elements of a common size (see imaging assembly 24 in figure 1 and column 7 lines 10-55, column 8 lines 43-64);

reconstructing an output of the x-ray detector into the diagnostic image (see figure 1 and column 7 lines 10-55);

wherein the marking elements are sized to cover only one of the sensor elements (see column 12 lines 21-33, wherein each marking element has a corresponding image coordinate).

Regarding **claim 23**, Seeley discloses everything as applied above in regards to claim 1. Seeley fails to disclose the limitations of claim 23. However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein radiation absorption of the marking elements is precalculated (see column 7 lines 5-19, wherein offset values are determined) and further including: using precalculated radiation absorption of the marking elements to correct degradation of the diagnostic image attributable to the marker elements (see column 7 lines 20-34).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing “wherein radiation absorption of the marking elements is precalculated and further including: using precalculated radiation absorption of the marking elements to correct degradation of the diagnostic image attributable to the marker elements”, as taught by Simon, for the purpose of when the imaged marks 20’ prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 24**, Seeley further discloses:

wherein the marking elements are carried on a mechanically flexible radiotranslucent layer (see column 10 lines 48-65 and column 11 lines 1-22, wherein the sheet is flexible in that it can move in position, and further is flexible in that any material has at least some degree of flexibility) and further including:

attaching the mechanically flexible layer to the patient (see column 11 lines 1-22, wherein one set of tracking elements is attached to the patient); and

monitoring movement of the patient from changes in the pattern in the diagnostic images as the patient moves (see column 11 lines 1-22).

Regarding **claim 25**, Seeley discloses everything as applied above in regards to claim 9. Seeley fails to disclose the limitations of claim 25. However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the marking elements in the reconstructed image are not individually apparent to a human or a machine in the reconstructed image (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving

the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "wherein the marking elements in the reconstructed image are not individually apparent to a human or a machine in the reconstructed image", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 26**, Seeley discloses everything as applied above in regards to claim 9. Seeley fails to disclose the limitations of claim 26. However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the marking elements have a predetermined x-ray absorption (see column 7 lines 5-19, wherein offset values are determined) and the data processing unit further after revealing the pattern, determines a location of each marking element from the pattern and corrects the image for the radiation absorption attributable to each marking element (see column 7 lines 20-34).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "wherein the marking elements have a predetermined x-ray absorption and the data processing unit further after revealing the pattern, determines a location of each marking element from the

pattern and corrects the image for the radiation absorption attributable to each marking element", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 27**, Seeley further discloses:

wherein the x-ray detector includes a plurality of individual sensor elements (see imaging assembly 24 in figure 1 and column 7 lines 10-55, column 8 lines 43-64);

the marking elements are each sized to cover one of the sensor elements (see column 12 lines 21-33, wherein each marking element has a corresponding image coordinate).

Regarding **claim 28**, Seeley further discloses:

translucent sheet is flexible (see column 10 lines 48-65 and column 11 lines 1-22, wherein the sheet is flexible in that it can move in position, and further is flexible in that any material has at least some degree of flexibility) and further including:

Regarding **claim 30**, Seeley discloses a method of determining a position of a patient in a diagnostic image (see column 16 lines 3-6), the method comprising:

attaching a pattern of marking elements (see column 10 lines 48-65)

passing x-rays through the patient and the pattern of marking elements (see x-ray source 22 in figure 1 and column 7 lines 10-55 and column 11 line 61 through column 12 line 20);

from the x-rays that have passed through the patient and the pattern of marking elements, generating a diagnostic image (see imaging assembly 24 in figure 1 and column 7 lines 10-55 and column 11 line 61 through column 12 line 20);

analyzing the generated image with the pattern recognition computer routine which recognizes the pattern of marking elements in the generated image and determines the position of the patient from the recognized pattern (see column 16 lines 3-6).

In addition, while the embodiment of Seeley discussed above fails to disclose claimed attaching a pattern of marking elements “to at least one of a patient and a patient examination table”, the examiner maintains that it would have been obvious, in view of an alternative embodiment, to provide:

attaching a pattern of marking elements “to at least one of a patient and a patient examination table” (see column 18 lines 46-66, wherein it is disclosed that affixing the marker array to the support table addresses the issue of the limited flexibility in positioning the image detector near the patient).

Therefore, the examiner maintains that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing attaching a pattern of marking elements "to at least one of a patient and a patient examination table", for the purpose of increasing flexibility in position the image detector near the patient.

Seeley fails to disclose "wherein the x-ray absorption level of the marking elements is such that the marking elements alter a gray scale of corresponding pixels of the generated image to such a small degree that individual marking elements are not visibly evident in the generated image to a computer pattern recognition routine". However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the x-ray absorption level of the marking elements is such that the marking elements alter a gray scale of corresponding pixels of the generated image to such a small degree that individual marking elements are not visibly evident in the generated image to a computer pattern recognition routine (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "radioopaque marking elements of a size, a shape, and a material which exhibits low absorption of the x-rays, the effect of which lies within the noise level of the x-ray image", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 31**, Seeley discloses everything as applied above in regards to claim 30. Seeley fails to disclose "wherein the individual marking elements in the generated image are not visibly evident to a human viewer". However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the individual marking elements in the generated image are not visibly evident to a human viewer (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and further see column 7 lines 1-4, wherein the calibration markers are semi-transparent).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "wherein the individual marking elements in the generated image are not visibly evident to a human viewer", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

Regarding **claim 32**, Seeley discloses everything as applied above in regards to claim 30. Seeley fails to disclose "wherein the x-ray absorption level of the marking elements lies within a noise level of the x-ray image". However, the examiner maintains that it would have been obvious to one of ordinary skill, in view of Simon, to provide:

wherein the x-ray absorption level of the marking elements lies within a noise level of the x-ray image (see 112 rejection above, and further see column 7 lines 20-34, wherein Simon discloses that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result, and thus the absorption of the markers in Simon can be said to be within a noise level of the image, since the underlying image can be recovered completely aside from image noise).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "wherein the x-ray absorption level of the marking elements lies within a noise level of the x-ray image", as taught by Simon, for the purpose of when the imaged marks 20' prove disturbing in the 2D projections, the imaged marks can subsequently be calculated out of the 2D projections in an image processing step.

7. *Claim 5* is rejected under 35 U.S.C. 103(a) as being unpatentable over Seeley in view of Simon, and further in view of Erbel et al. (US Patent Application 2002/0122530), hereinafter referenced as Erbel.

Regarding **claim 5**, Seeley discloses everything as applied above in regards to claim 1. However, Seeley fails to disclose "wherein the position of at least one further object is determined in the image, wherein a second pattern of marking elements, which do not show up individually in the image, is attached to the further object, and wherein the second pattern is different from the first pattern". However, the examiner maintains that it would have been obvious, in view of Erbel, to provide:

wherein the position of at least one further object is determined in the image, wherein a second pattern of marking elements, which do not show up individually in the image, is attached to the further object, and wherein the second pattern is different from the first pattern (see Erbel figure 4 and paragraph 32, wherein Erbel discloses a computer tomography, wherein a calibration phantom 5 comprises inner marking rods and outer point markers 5 arranged on its bed 6, as disclosed in paragraph 32 and

exhibited in figure 4, and further see figure 5 and paragraph 33, wherein Erbel further discloses patient marking having the reference numeral 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Seeley, by specifically providing "wherein the position of at least one further object is determined in the image, wherein a second pattern of marking elements, which do not show up individually in the image, is attached to the further object, and wherein the second pattern is different from the first pattern", as taught by Erbel, for the purpose of detecting the position of both the bed and the patient so that the patient can be positioned correctly on the bed, while the patient markings are not recorded in the image thus not degrading image quality.

8. *Claims 12 and 29* are rejected under 35 U.S.C. 103(a) as being unpatentable over Seeley in view of Simon, and further in view of Ogawa (US Patent 5,572,251), hereinafter referenced as Ogawa.

Regarding **claim 12**, Seeley discloses everything as applied above in regards to claim 11. However, Seeley fails to disclose "said pattern is a two-dimensional, cyclical maximum-length sequence". However, the examiner maintains that it would have been obvious, in view of Ogawa, to provide:

said pattern is a two-dimensional, cyclical maximum-length sequence (see Ogawa column 4 line 66 through column 5 line 45, wherein it is disclosed that by having a binary maximum length sequence pattern of elements in between the object being

imaged and image sensor, when the object of interest encompasses only a region of the pattern, the location of the object in relation to the pattern can be uniquely determined).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Schuetz, by specifically providing "said pattern is a two-dimensional, cyclical maximum-length sequence", as taught by Ogawa, for the purpose of being capable of determining the location of the patient in relation to the pattern of elements when the region of the patient being imaged is smaller then the total area of the pattern of elements.

Regarding **claim 29**, Seeley discloses everything as applied above in regards to claim 12. However, Seeley fails to disclose "wherein the marking elements have N different absorption levels and the two dimensional, cyclical maximum length sequence is N-valent, where N is a plural integer". However, the examiner maintains that it would have been obvious, in view of Ogawa, to provide:

wherein the marking elements have N different absorption levels and the two dimensional, cyclical maximum length sequence is N-valent, where N is a plural integer (see Ogawa column 4 line 66 through column 5 line 45, wherein it is disclosed that by having a binary maximum length sequence pattern of elements in between the object being imaged and image sensor, when the object of interest encompasses only a region of the pattern, the location of the object in relation to the pattern can be uniquely determined, wherein the sequence suggested by Ogawa would be binary, i.e. 2-valent, and wherein there are 2 different kinds of marks in Ogawa).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Schuetz, by specifically providing "wherein the marking elements have N different absorption levels and the two dimensional, cyclical maximum length sequence is N-valent, where N is a plural integer", as taught by Ogawa, for the purpose of being capable of determining the location of the patient in relation to the pattern of elements when the region of the patient being imaged is smaller then the total area of the pattern of elements.

Response to Arguments

9. Applicant's arguments filed November 24 2008 have been fully considered but they are not persuasive.

Applicant argues in regards to claim 1 that Seeley fails to disclose "providing marking elements that individually are not visibly evident to a computer system or a human in a diagnostic image" (at page 8 of Applicant's Response). First, the examiner notes the 112 2nd paragraph rejection above, and the interpretation of the limitation brought forth therein. Further, the Examiner notes that Simon, rather than Seeley has been relied on to teach this amended limitation.

Applicant argues that Seeley fails to disclose for providing marking elements to be of a size, a shape, and a material which exhibit low absorption of the x-rays, the effect of which lies within a noise level of the x-ray image since "in Seeley, the marking elements must be visible in the reconstructed image, i.e., they must be significantly

above the noise level of the x-ray image" (at pages 8 and 9 of Applicant's Response). However, this argument is moot as Simon is relied on for the limitations regarding this argument.

Applicant argues that Simon fails to disclose for providing marking elements to be of a size, a shape, and a material which exhibit low absorption of the x-rays, the effect of which lies within a noise level of the x-ray image since "Simon, like Seeley must locate the individual markers in the generated image, i.e., the effect of the markers in the x-ray image must be significantly above the noise level. That the markers are above the noise level in the generated x-ray image in both Seeley and Simon is further emphasized by each of them disclosing a post processing routine in which, after the markers have been individually found and the patient position determined, the effect of the markers is subtracted out of the displayed image. Thus, the marking elements of both Seeley and Simon must be of a size, a shape, and a material which exhibits a high absorption of x-rays, the effect of which lies well above the noise level of the x- ray image" (at pages 8 and 9 of Applicant's Response). However, the Examiner respectfully disagrees. The Examiner maintains that Simon discloses (column 7 lines 20-34) that once the offset of a particular image has been determined, processor 303 proceeds with eliminating the artifacts by identifying the calibration marker projections, and, for each identified projection, subtracting the acquired offsets from the pixels of the projection, wherein ideally steps 901-904 will completely eliminate the artifacts from the image while leaving the true underlying image, but practically image noise may prevent a perfect result. Thus since the markers can be completely eliminated from the image

aside from image noise preventing a perfect result, the markers can be considered to have ***an effect*** within the noise level of the x-ray image.

Applicant further notes that "It should also be noted that Seeley and Simon can only determine the location of the patient from an image in which the markers are individually visibly evident. Once Seeley or Simon perform the mathematical process to remove the markers from the image, neither Seeley nor Simon can locate the position of the patient from the image" (at page 9 of Applicant's Response). However, the Examiner notes the various 112 2nd paragraph rejections brought forth in regards to the various instances of claimed markers not individually visibly evident. Further, the examiner notes that it is irrelevant as to the analysis of the current claims that "once Seeley or Simon perform the mathematical process to remove the markers from the image, neither Seeley nor Simon can locate the position of the patient from the image".

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DANIEL ZEILBERGER whose telephone number is (571)270-3570. The examiner can normally be reached on M-F 8:30-6pm est (alternate Fridays off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vikkram Bali can be reached on (571)272-7415. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Daniel Zeilberger
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